PATENT SPECIFICATION

Application Date: Nov. 28, 1941. No. 15365/41. 553,107

(Patent of Addition to No. 505,452: dated Nov. 19, 1937).

Complete Specification Left: Dec. 28, 1942.

Complete Specification Accepted: May 7, 1943.

PROVISIONAL SPECIFICATION

Improvements in and relating to Chemical Reaction Chambers

We, SYNTHETIC OILS LIMITED, a British Company, of 31, East Street, Epsom, in the County of Surrey, and ALFRED AUGUST AICHER, a British Subject, of 22, Holland Avenue, Wimbledon, in the County of Surrey, do hereby declare the nature of this invention to be as follows:—

This invention relates to reaction chambers for exothermic reactions and is an improvement in or modification of the apparatus for carrying out such reactions described and claimed in our prior Letters Patent No. 505,452.

The reaction chamber in our prior Letters Patent consists of a plurality of catalyst containing tubes connected together at their ends by headers forming an inlet and outlet for the reaction materials, the tubes being surrounded by a common casing partly filled with a liquid which (under the prevailing pressure conditions) boils at the temperature at which the reaction chamber is to be maintained, the lower part of the casing being provided with an inlet for the liquid, while the upper part of the casing contains the vapour produced by the boiling liquid and is provided with an outlet for the vapour. In addition one or more tubes are provided which communicate at their upper ends with the vapour space and extend into or through the liquid space of the casing without communicating therewith.

According to the present invention the same general arrangement is adopted and no alteration in principle is involved, but the construction of the apparatus is modified in that the central tube shown in the drawings of the prior specification of the patent above alluded to is modified so that it forms a large common chamber containing a liquid in which the catalyst tubes are immersed leaving an annular space between its outer wall and the casing. An inlet pipe for liquid is provided passing through the outer casing into the liquid container at its lower end and at the upper end a pipe leads from the vapour space at the top of the outer casing into which steam can be introduced when starting up or vapour can pass out.

In the operation of the apparatus condensation takes place on the outside of the water container and collects in the annular space before mentioned, and a condensation discharge pipe is provided at the lower end of the casing.

The new construction has the advantage of simplifying the piping arrangements resulting in considerable economy, and moreover is advantageous in that there is a considerable increase in the condensation surface available which also facilitates initial warming up by steam introduced into the annular space between the water container and the outer casing.

Dated this 28th day of November, 1941.

A. A. THORNTON,
Chartered Patent Agents,
7, Essex Street, Strand,
London, W.C.2,
For the Applicants.

COMPLETE SPECIFICATION

Improvements in and relating to Chemical Reaction Chambers

We, SYNTHETIC OILS LIMITED, a British Company, of 31, East Street, Epsom, in the County of Surrey, and ALFRED AUGUST AICHER, a British Subject, of 22, Holland Avenue, Wimbledon, in the County of Surrey, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to chemical reaction chambers for exothermic reactions, having means for controlling the temper-

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ature of the reaction chamber in accordance with our prior Letters Patent No. 505,452 and is an improvement in, or modification of, the invention forming the subject-matter of the said prior patent.

The reaction chamber in our prior Letters Patent consists of a plurality of catalyst containing tubes connected together at their ends by headers forming inlet and outlet chambers for the reaction materials, the tubes being divided into groups, each group being surrounded by a common casing partly filled with a liquid which (under the prevailing pressure conditions) boils at the temperature at which the reaction chamber is to be maintained. The lower part of the casing is provided with an inlet for the liquid, while the upper part of the casing contains the vapour produced by the boiling liquid and is provided with an outlet for the vapour. One or more additional tubes are provided in each unit or group of tubes which communicate at their upper ends with the vapour space and extend into or through the liquid space of the casing without communicating therewith.

According to the present invention the same general arrangement is adopted and no alteration in principle is involved, but the additional tube associated with each group of reaction tubes and communicating at its upper end with the vapour space of the casing surrounding said group of tubes, is in the form of a cylindrical chamber enclosing the group of reaction tubes and containing the liquid in which said tubes are immersed, the wall of said chamber being spaced from the wall of said casing to form an annular collecting space for liquid condensing on the outside of said cylindrical wall. An inlet tube for the liquid in the cylindrical chamber passes through the lower part of the wall of the casing of the unit and through the annular space for the condensate, whilst an outlet tube for drawing off the condensate from its annular collecting space extends laterally from the side wall of the outer casing of the unit.

The invention is illustrated by the accompanying drawing, which shows a reaction tube unit constructed in accordance therewith.

The apparatus may comprise one, or any number of, reaction tube units A as illustrated, the several units, when there are more than one of such units, communicating at their upper and lower ends with common header chambers 3 at their upper ends and 5 at their lower ends.

Each unit A comprises a plurality of parallel vertical tubes 1 joining chambers 3 and 5, which are filled to within a short distance of their upper ends with catalytic material 2 and together constitute the reaction chamber. The gaseous reaction material is continuously fed into the chamber 3 through inlet pipe 4 and continuously withdrawn from chamber 5 through outlet pipe 6.

The group of tubes 1 is surrounded by a cylindrical wall 14 forming a chamber closed at its lower end, which contains a liquid 8 through which the tubes 1 pass. Spaced from the wall 14, to form therewith an annular intervening space, is the outer cylindrical casing 7, and a lateral outlet pipe 15 communicates with said annular space through the wall of casing 7.

The liquid 8 has a boiling point, at the pressure prevailing within the casing 7, which is equal to the temperature at which it is desired that the reaction shall take place, and its surface is somewhat above the level of the catalytic material in tubes 1. The upper part of the casing 7 above the level of liquid 8 constitutes a vapour space 9 fitted with an outlet pipe 10 through which the vapour of the liquid produced by the heat of the reaction is continuously withdrawn and passed to a condenser. Fresh liquid is continuously admitted through a lateral inlet pipe 12 passing through a wall of casing 7 and the annular space surrounding chamber 14. The condensed liquid may be returned to the inner chamber 14, thus forming a closed system for the cooling liquid.

When there are a plurality of reaction units, all the inlet pipes 12 may be connected by a common pipe to a liquid source or reservoir, whilst all the vapour outlet pipes 10 may be connected by a common pipe to the condenser.

When the reaction is proceeding normally, the heat generated in the reaction tubes 1 is transmitted through the walls of these tubes to the liquid 8 and causes vaporisation of that liquid, the temperature of the whole system being thus maintained at the boiling point of the liquid 8. It may, however, easily occur in practice that the temperature of some part of the apparatus falls below the desired point and such variations in temperature are detrimental to the progress of the reaction.

The outer wall of chamber 14 serves to minimise any such fall of temperature and ensure its rapid correction for if the temperature of the unit should fall below the desired temperature (that is the boiling point of the liquid 8), vapour from vapour space 9 will condense on the outer

surface of the wall of chamber 14. The latent heat of vaporisation of this vapour will thus be given up to the wall of chamber 14 and transmitted thereby to the contained liquid 8. This process continues until the temperature of the unit has been restored to normal. The condensate on the outer wall of chamber 14 collects in the annular space between it and the wall of casing 7 and can be drawn off when desired through outlet pipe 15 and either run to waste or returned, together with the condensate of the vapour withdrawn through outlet 10, to the liquid inlet 12. If there are several reaction units the outlet pipes 15 of the several units may, of course, be connected to a common drainage or draw off pipe.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Apparatus for carrying out exothermic reactions in accordance with our prior Letters Patent No. 505,452, wherein the additional tube associated with each group of reaction tubes and communicating at its upper end with the vapour space of the casing surrounding said group of tubes, is in the form of a cylindrical chamber enclosing the group of reaction tubes and containing the liquid in which said tubes are immersed, the wall of said chamber being spaced from the wall of said casing to form an annular collecting space for liquid condensing on the outside of said cylindrical wall.

2. Apparatus according to claim 1, wherein an inlet tube for the liquid in the cylindrical chamber passes through the lower part of the wall of the casing of the unit and through the annular space for the condensate.

3. Apparatus according to claim 1 or 2, wherein an outlet tube for drawing off the condensate from its annular collecting space extends laterally from the side wall of the outer casing of the unit.

4. Apparatus for carrying out exothermic reactions comprising one or more units substantially as herein described with reference to, and as illustrated by, the accompanying drawing.

Dated this 28th day of December, 1942.
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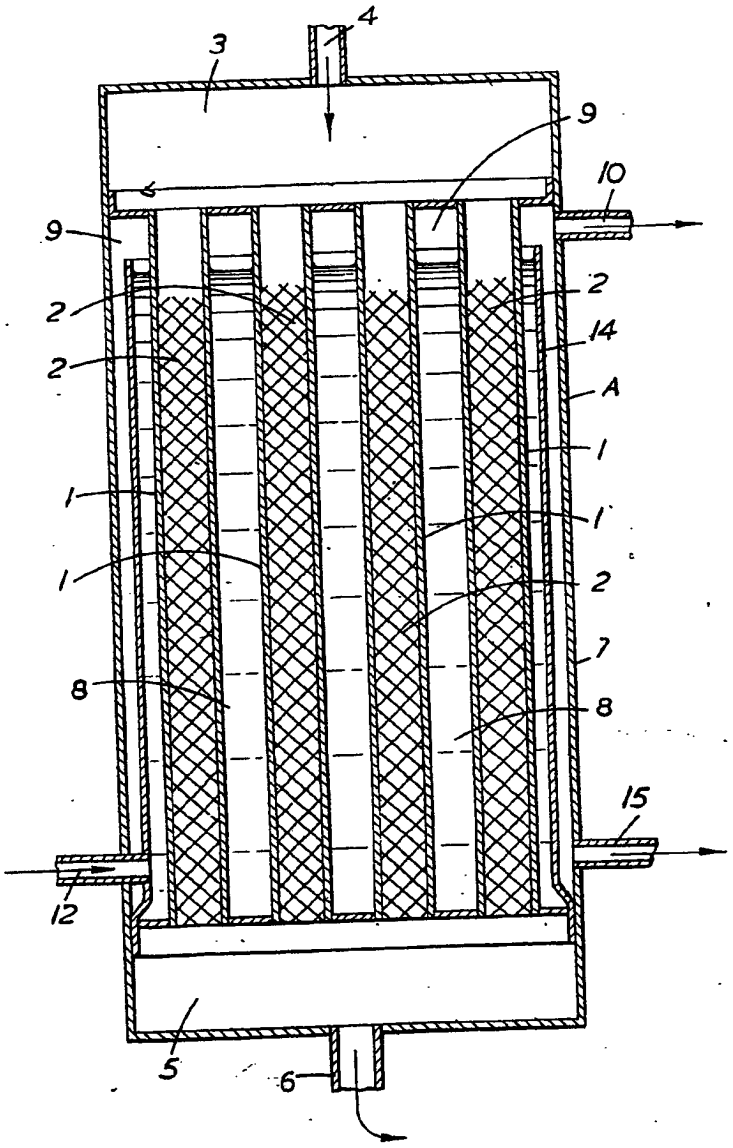

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